

MiniBooNE BPM System

Vertical BPMs

04Jan2010

Conditions

- Data taken 01/04/2010, between 11:15 and 11:30.
- VT860 varied from -2 amps to +2 amps.
- Data collected at 860, 861, 864, 867, 869, 870, 871, 873, and 875 location.
- Used MiniBooNE ACNET DAQ; this allowed data to be taken simultaneously at all locations for old and new electronics.
- 755 datum per location.

Scale Factors and Offsets

Scale	Z:VP860	Z:VP861	Z:VP864	Z:VP867	Z:VP869	Z:VP870	Z:VP871	Z:VP873	Z:VP875
m	0.982	0.960	0.935	1.020	1.016	0.865	0.888	1.002	0.748
b	-1.092	3.763	-12.509	-1.403	-1.647	-1.267	4.390	15.077	1.797

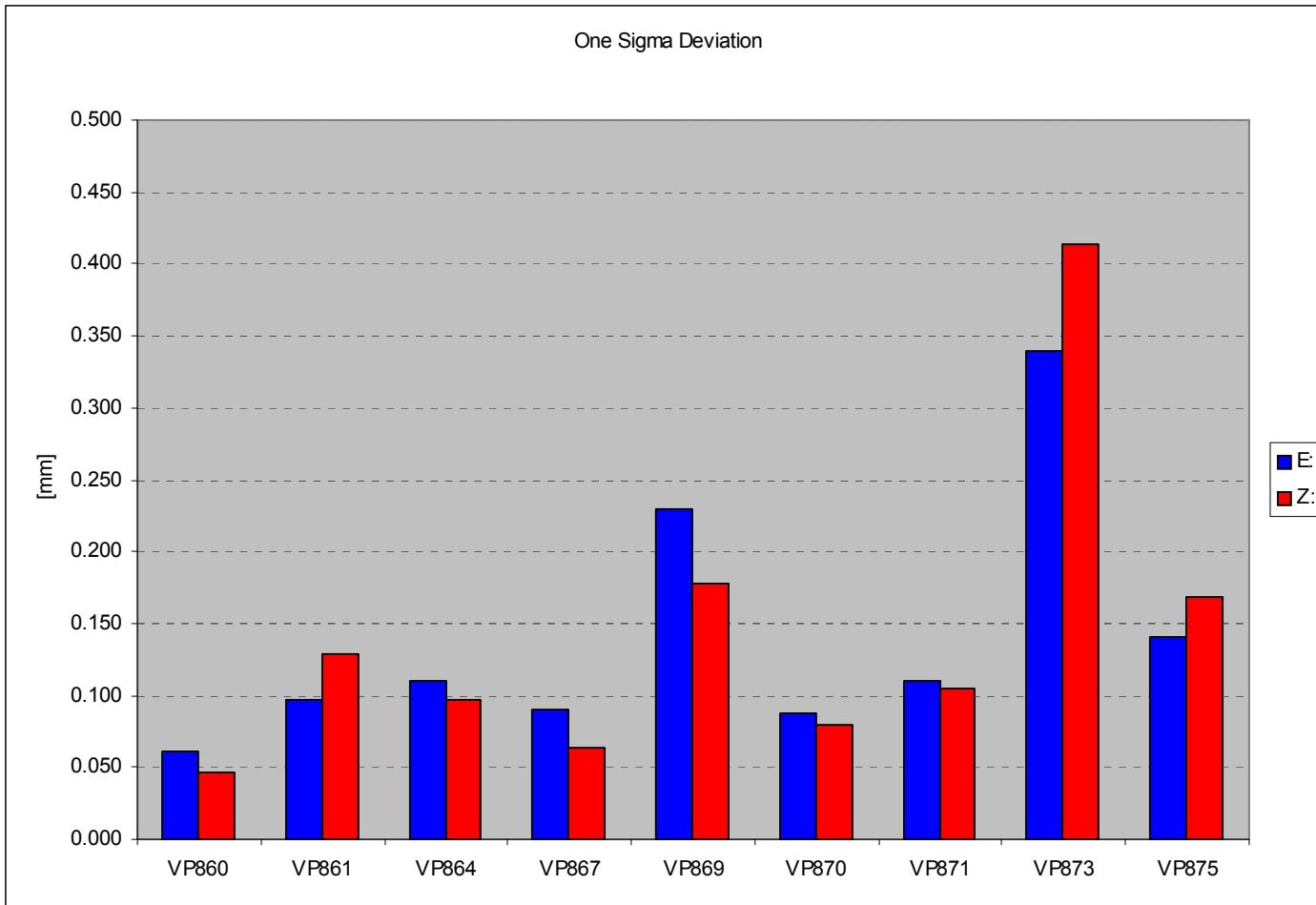
- Z: data is scaled to match E: data.

Correlations

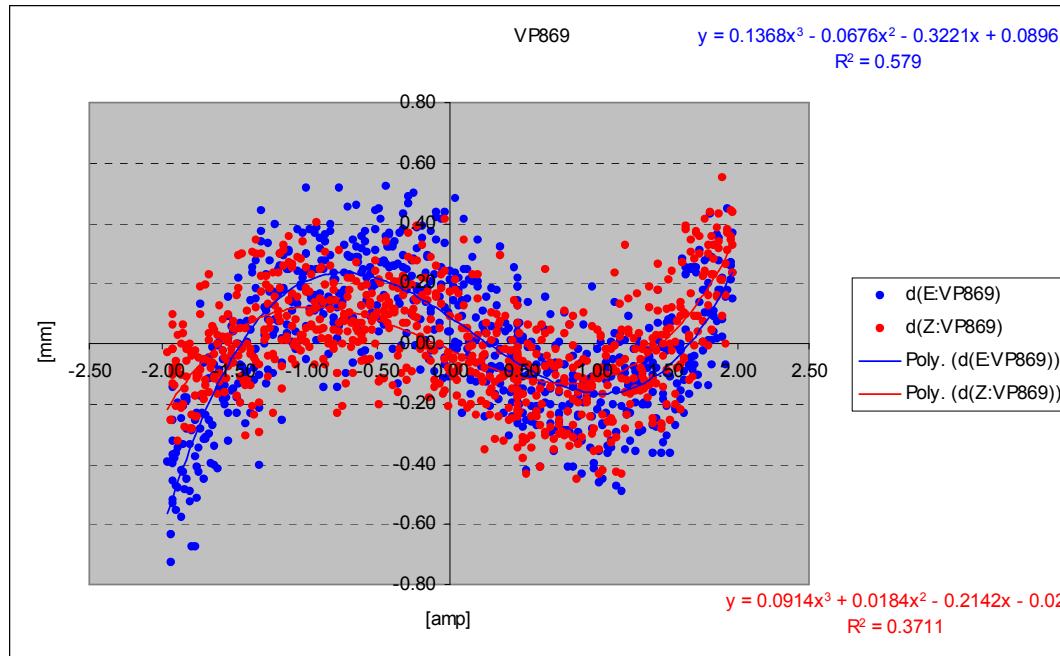
	VP860	VP861	VP864	VP867	VP869	VP870	VP871	VP873	VP875
E:VP860	1.000	0.999	0.998	-0.999	-0.999	-0.998	-0.851	0.999	0.998
E:VP860	0.998	0.998	0.998	-0.999	-0.999	-0.998	-0.863	0.998	0.997
Z:VP860	1.000	0.999	0.999	-0.999	-0.999	-0.999	-0.868	0.999	0.998
E Z	0.998	1.000	1.000	1.000	1.000	1.000	0.951	0.999	0.998

- Calculate correlations between VP860 and downstream devices.
 - Same electronics (E: and E: or Z: and Z:) are green.
 - Different electronics (E: and Z:) are blue.
- Calculate correlation between same device but different electronics (yellow)

Linear Fit to Magnet Current

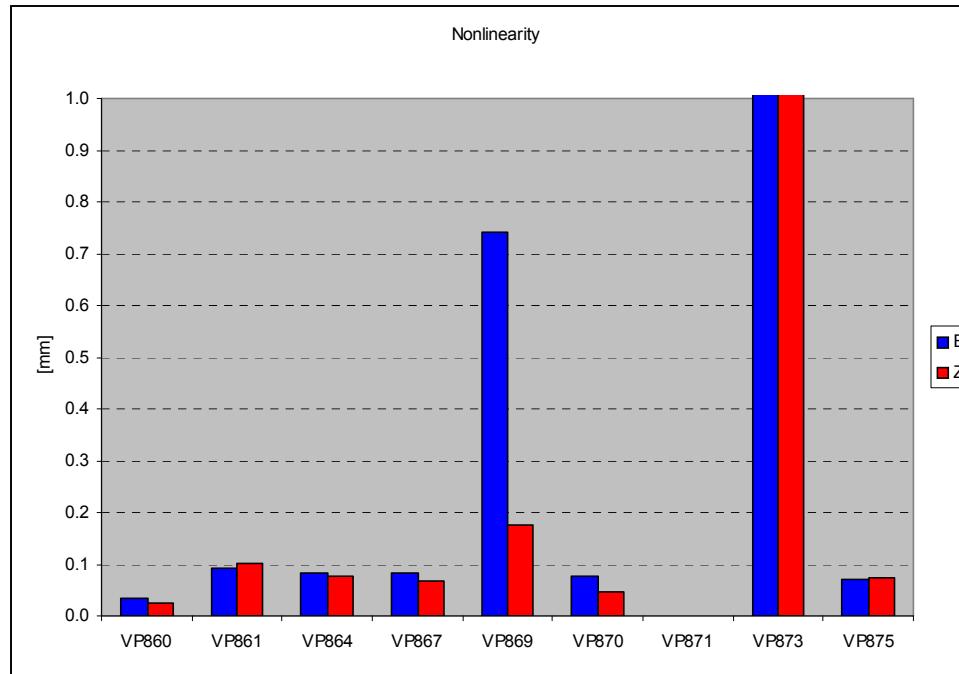


Nonlinearity



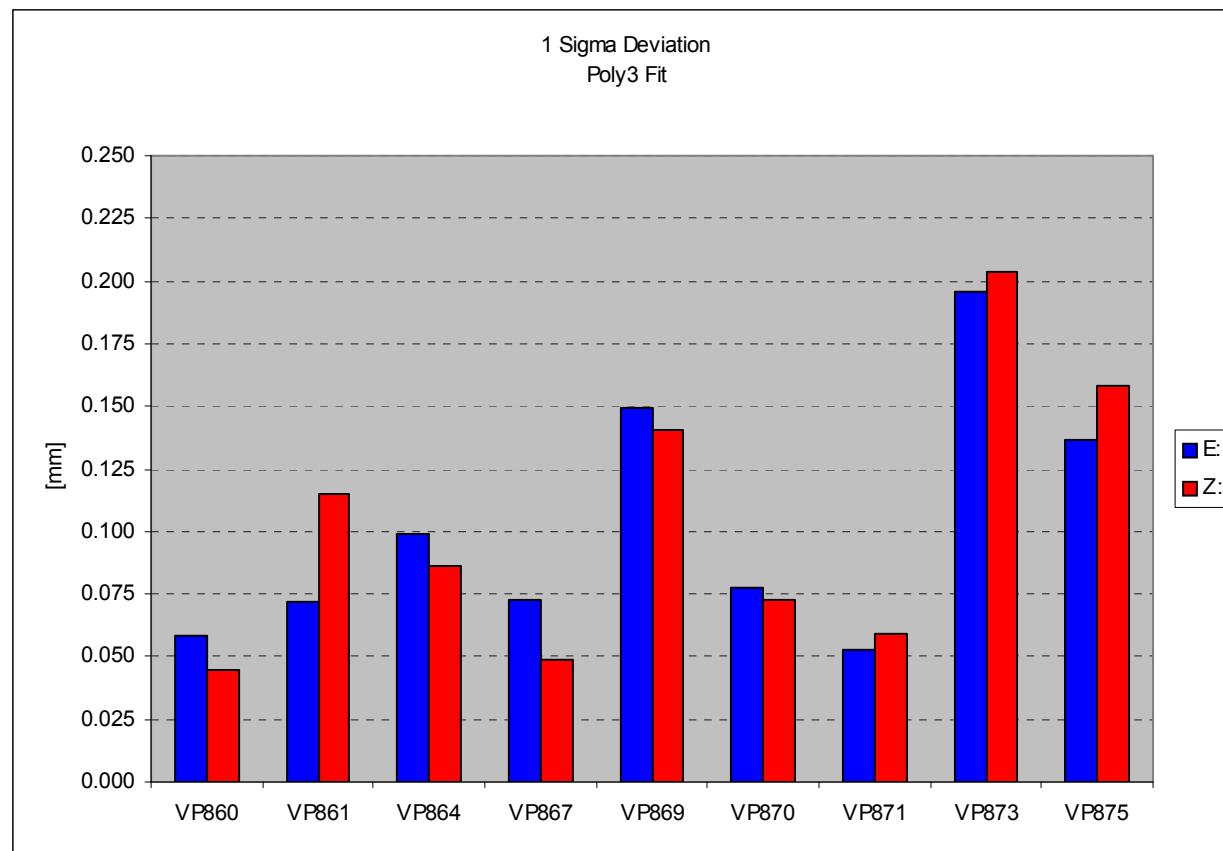
- Linear fit residuals versus magnet current.
- Third order polynomial is a reasonable fit.

Measure of Nonlinearity



- Fit residuals to third order polynomial as a function of position.
- Integrate area under curve.
- Divide by range.

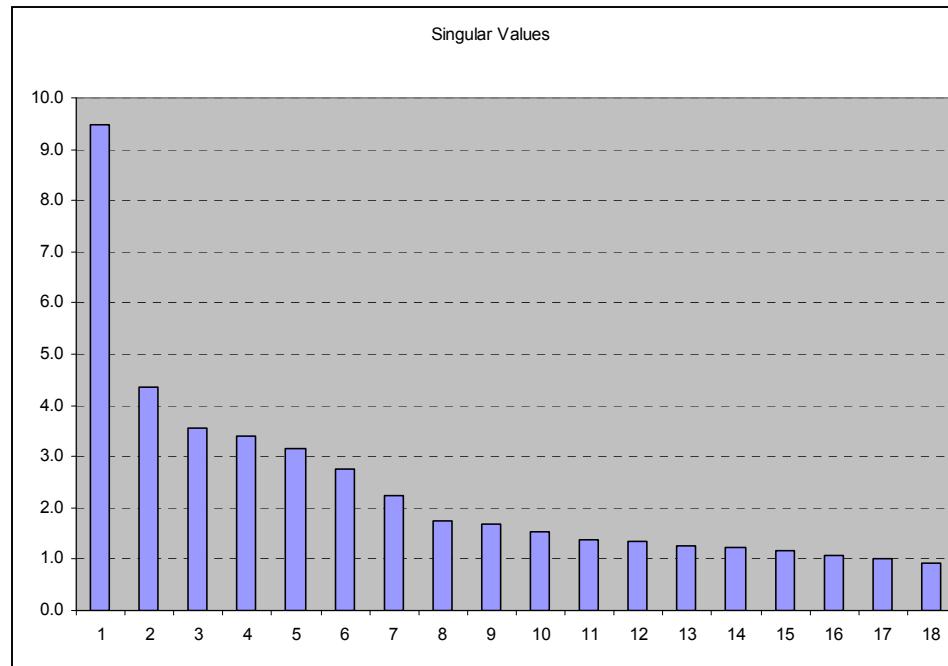
Resolution After Polynomial Fit



Remove Beam Jitter

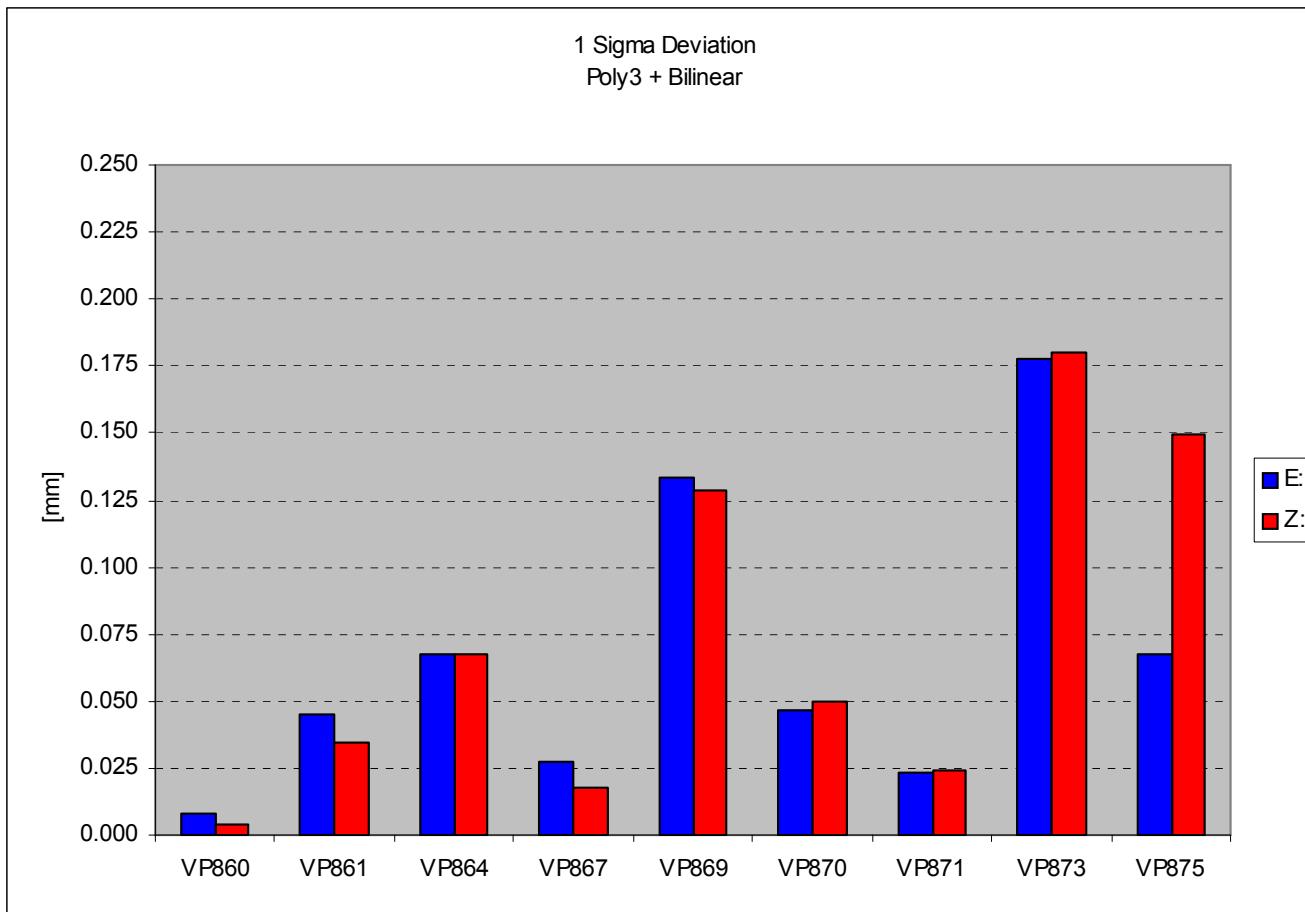
- Assume any remaining spread is due to beam motion.
- Assume no coupling between planes, and no momentum spread.
- Calculate SVD, then fit data to bilinear form.

Singular Values

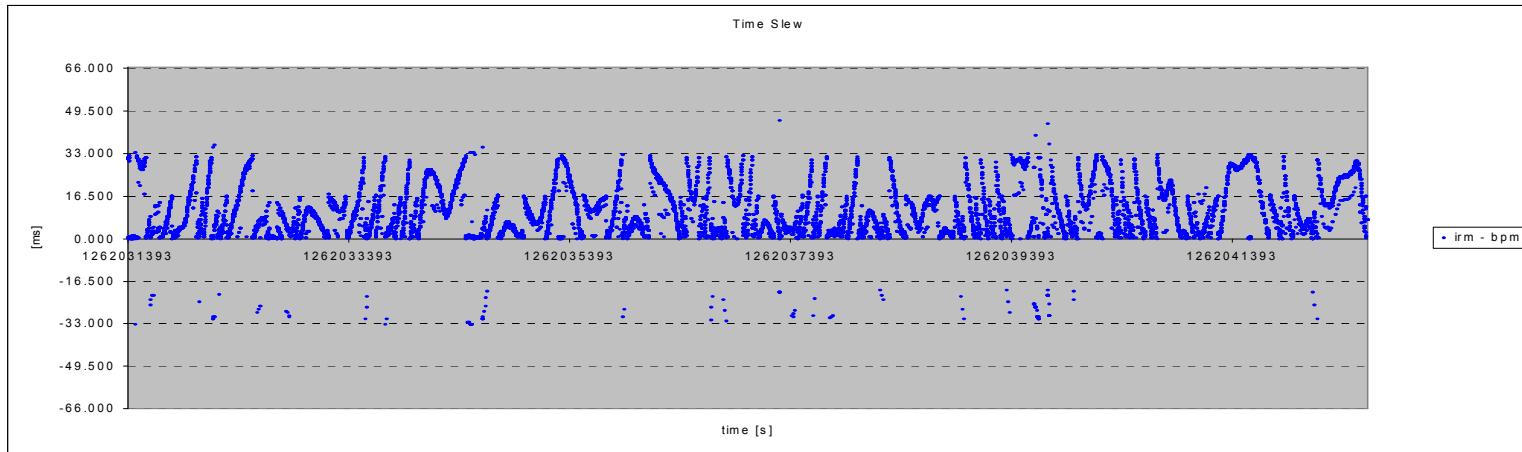


- First singular value much greater than rest.
- Second value not significantly greater than third.
- This may be the result of optics.
- Continue with bilinear fit.

Final Fit

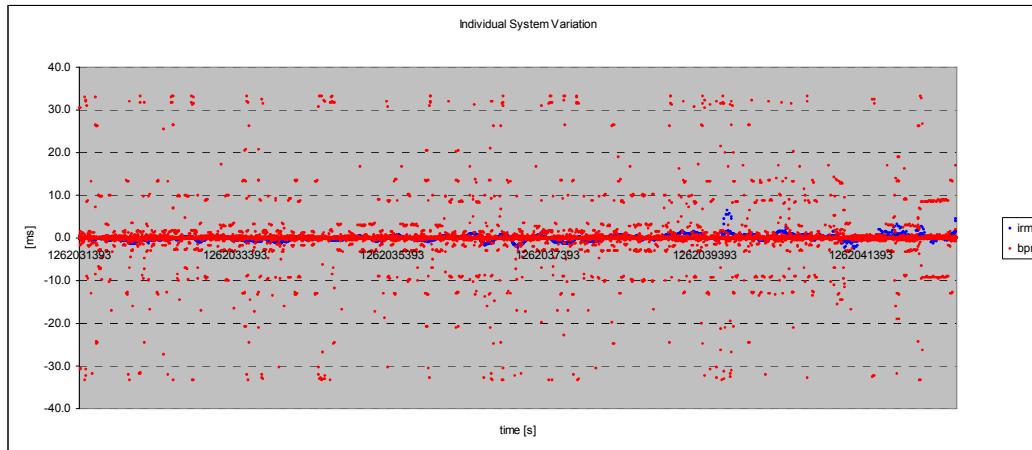


Time Slew



- Timestamp difference (between IRM and BPM) varies significantly.
- Difference can exceed half of one Booster cycle.
- Which spill is beam associated with?

Spill-to-spill variation



- Calculate difference between spill, modulo (1/15 Hz).
- IRM varies by at most 7 ms.
 - Smooth variation.
- BPM varies by +/- 33 ms.
 - Apparently random variation.

Conclusions

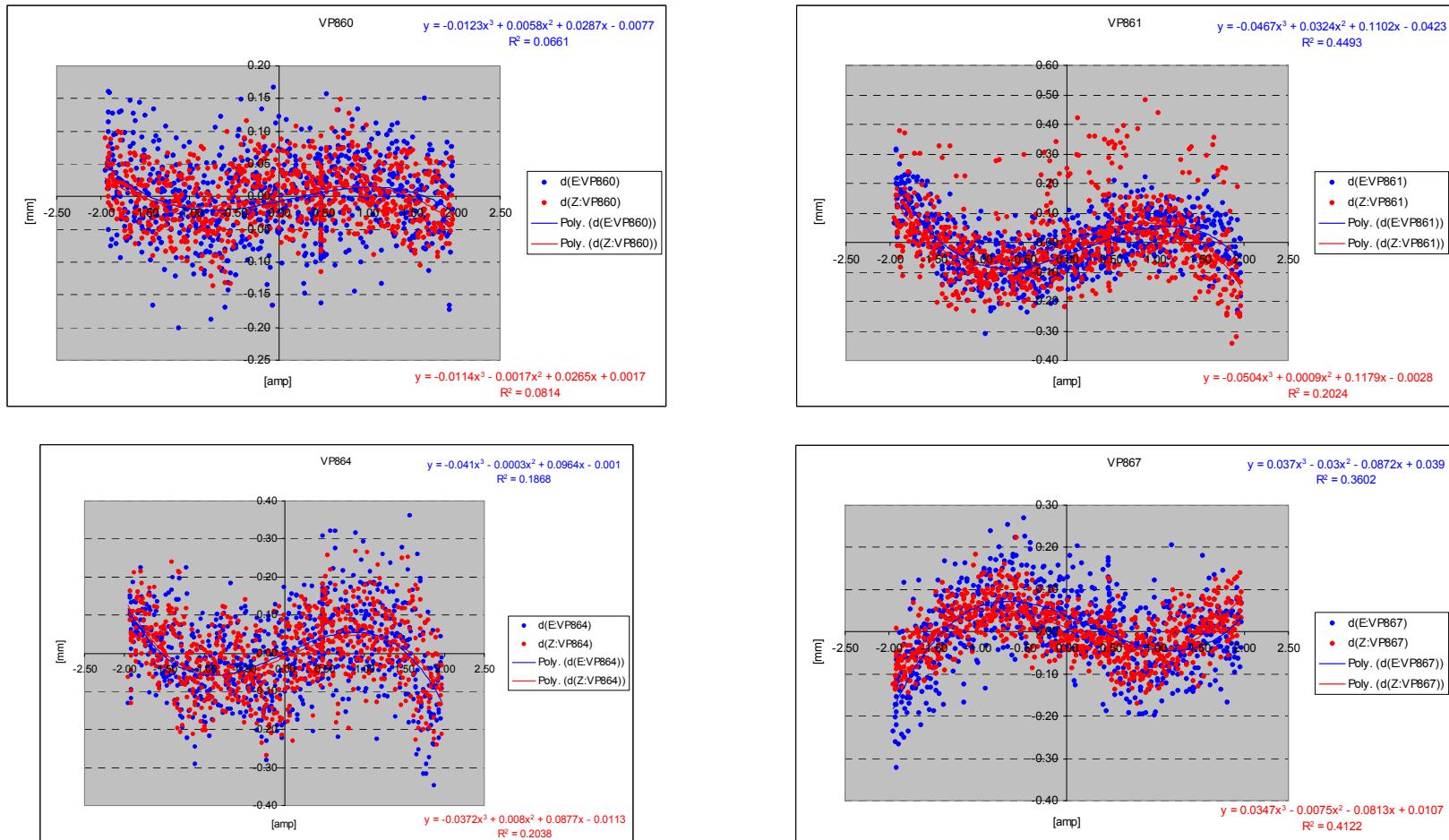
- With the exception of VP875, resolution of old and new electronics are comparable.
 - Probably just needs a little work.
- Very large difference in resolution between locations.
 - Due to optics?
- Time slew still a major problem.

Back Up Slides

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T. Kobilarcik

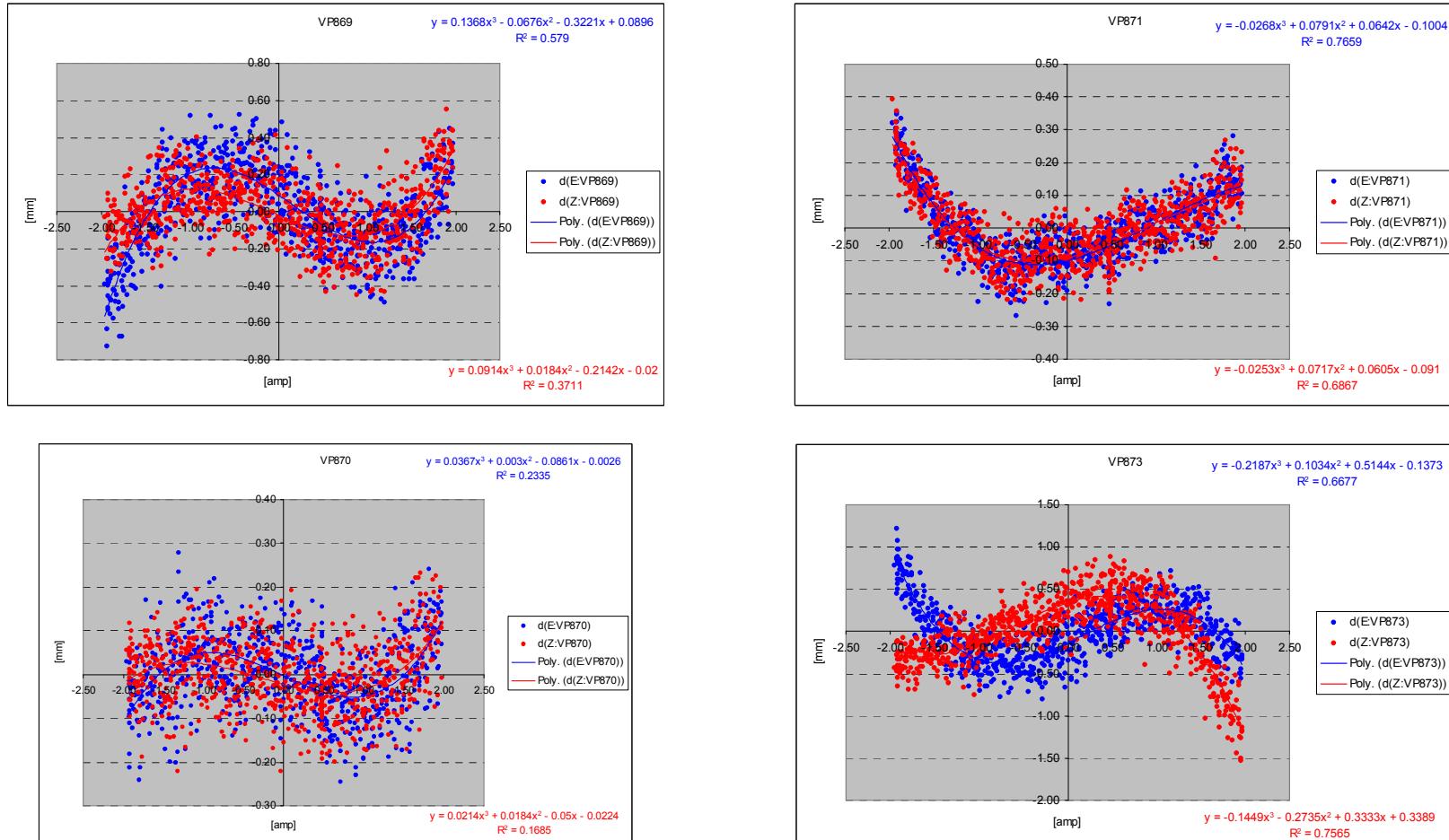
BMP 860 - 867



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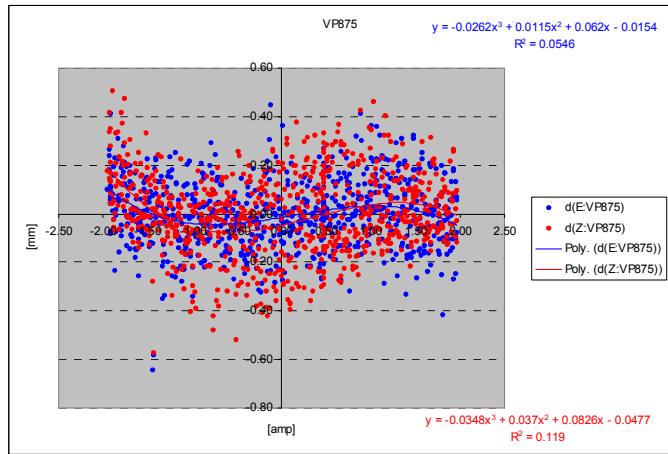
BPM 869 - 873



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BPM 875



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